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14. ABSTRACT Operational Net Assessment (ONA) is critical to the new Standing Joint Force Headquarters (SJFHQ) concept. SJFHQs were designed by the US Joint Forces Command (JFCOM) to provide Regional Combatant Commanders in-depth analysis for a specific adversary or situation within their area of responsibility. This paper does not seek to debunk the ONA process, nor antagonize the SJFHQ concept. The author desires to provide insight upon perceived weaknesses in existing doctrine and promote issues for further discussion within the Joint Intelligence Community. The collaborative ONA process as designed by JFCOM is subjective. The lack of a formal vetting process to review information applied for analysis is dangerous. Current network modeling tools, the cornerstone of ONA's analytical construct, have limitations that must be recognized as tenuous assumptions. Product output must be sufficiently analyzed in concert with operational planners and scaled to mission requirements to support the Commander's Intent. The author has drawn from current literature on the ONA template and reviewed the construct in order to create a "truth in lending" approach. The goal is not simply to identify the present limitations of ONA, but provide recommendations and areas for improvement. For ONA to be relevant, its level of confidence must be clearly understood by the warfighter.					
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OPERATIONAL NET ASSESSMENT:
A Framework for Social Network Analysis and Requirements for
Critical Debate

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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14 February 2005

**Abstract of
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Operational Net Assessment (ONA) is critical to the new Standing Joint Force Headquarters (SJFHQ) concept. SJFHQs were designed by the US Joint Forces Command (JFCOM) to provide Regional Combatant Commanders in-depth analysis for a specific adversary or situation within their area of responsibility. This paper does not seek to debunk the ONA process, nor antagonize the SJFHQ concept. The author desires to provide insight upon perceived weaknesses in existing doctrine and promote issues for further discussion within the Joint Intelligence Community. The collaborative ONA process as designed by JFCOM is subjective. The lack of a formal vetting process to review information applied for analysis is dangerous. Current network modeling tools, the cornerstone of ONA's analytical construct, have limitations that must be recognized as tenuous assumptions. Product output must be sufficiently analyzed in concert with operational planners and scaled to mission requirements to support the Commander's Intent. The author has drawn from current literature on the ONA template and reviewed the construct in order to create a "truth in lending" approach. The goal is not simply to identify the present limitations of ONA, but provide recommendations and areas for improvement. For ONA to be relevant, its level of confidence must be clearly understood by the warfighter.

Introduction

*The difficulty of accurate recognition constitutes one of the most serious sources of friction in war.*¹

--- Carl von Clausewitz

While the doctrinal explanations of Operational Net Assessment (ONA) appear rather straightforward, there is a definite focus on results (ends) to the exclusion of process (ways or means). Discussion of potential bias within information or analyst perceptions is missing and must be accountable in the process. Human nature prevents total objectivity: “The process of intelligence analysis and assessment is a very personal one. There is no agreed-upon analytical schema, and the analyst must use his belief system to make assumptions and interpret information.”² As Robert Deutsch has noted about American culture: “Attempts at image creation are now an invasive part of our environment: some pollute and some enhance human experience.”³ This applies as well to the analytical construct of ONA. Whether the image created is driven by the ONA element itself, information provided by outside Agencies, or the way we apply modern technology; all of our limitations must be observed and understood. Uncertainty must be factored in a realistic process for ONA. The level of confidence in the analysis must be a core component of the end product for the warfighter. We must be always wary of the “hard facts of capability and the soft assumptions of intention.”⁴

ONA and the SJFHQ: Background and Definitions

*The secret of a sound, satisfactory decision...has always been that the responsible official has been living with the problem before it becomes acute.*⁵

--- President Dwight D. Eisenhower

Joint Forces Command (JFCOM)'s doctrine declares ONA as "the integration of people, processes, and tools that use multiple information sources and collaborative analysis to build shared knowledge of the adversary, the environment, and ourselves."⁶ ONA's ability to predict adversary actions as resultant effects from our own efforts is the ultimate goal in supporting Effects-Based Operations (EBO). Doctrine explains this as a long-term analytical process where the Standing Joint Force Headquarters (SJFHQ) and its ONA element delve into a Commander's prioritized regional concerns long before a crisis brews.

Current literature frames ONA as interpreting significance from an adversary through the lens of systems.⁷ A critical portion of ONA is System-of-Systems Analysis (SoSA), which seeks to "identify, analyze, and relate the goals and objectives, organization, dependencies...inter-dependencies [and] influences" of an adversary under investigation.⁸ The linkage between SoSA and EBO is through determining vulnerabilities of the adversary. This, in turn, creates exploitation possibilities for desired effects, determined by the Commander.⁹ Per JFCOM doctrine, the SoSA process is heavily reliant upon information provided to the SJFHQ's ONA team by groups both within the US Government and on the outside. Non-governmental organizations (NGOs) are listed as core elements of ONA input, along with Centers of Excellence (COE): Academic institutions, laboratories, and think tanks.¹⁰ The SoSA approach dissects the adversary into smaller functional components for individual study.¹¹ SoSA measures causal relationships between various Blue actions and subsequent Red effects within the elements of national power: Diplomatic, Information, Military, and Economic (DIME).¹² The analysis is conducted against six areas of an adversary's capabilities or organization (political, military, economic, social, information, and infrastructure – PMESII).¹³

Data Requirements for ONA

*We could have talked about the science of Intelligence, but...the science of Intelligence is yet to be invented.*¹⁴

--- Charles Allen

The crux of SoSA is inherent in its name: the study of systems. “A mature ONA for a single focus area will likely entail thousands of nodes and associated relationships, tasks, and potential effects.”¹⁵ The voluminous data that can be compiled for analysis in a network construct requires sophisticated technical assistance through computer simulation modeling. The two most basic models for such analysis are conceptual and computational. Conceptual models review qualitative social and cultural behavior and explain relationship dynamics among nodes or individuals. Computational models provide quantitative input/output results, normally in a numeric or mapped fashion.¹⁶ Both models allow one to understand complex networks and assist in developing strategies to counter adversary actions.¹⁷ The limitation of conceptual models is their development involves a long-term research effort. There are applications for such tools in pre-crisis ONA analysis; however, strict reliance on conceptual modeling is a negative for crisis action planning. The need to transition data sets from a static (but robust) conceptual model to a more dynamic (and rapid) computational effort has been identified, but the level of effort weighted in the computational sphere limits social and cultural nuances from entering the equation.

The tools available now cannot handle both types of information at a fidelity required by ONA.¹⁸ Current systems can map any given relationship into a social network; provide the raw data, and one has a wire-diagram for a PowerPoint slide in short order. However, the layers of detail gathered by the humanist through conceptual processes are lost. This skews

true effects determination, the reason for ONA within the EBO construct. The ability to focus on conceptual processes in aggregate while allowing technology to assist is required. The focus should be upon a “concept-driven activity rather than an external data-driven activity.”¹⁹ The SoSA process cannot be mutually exclusive.

Post-conflict operations in Iraq show us the warfighter requires analysis to explain the following:

- What is the enemy thinking and why?
- What will they do if I take action X and why?²⁰

These are not pure quantitative expressions. Qualitative variables such as culture are significant factors.²¹ To reduce the time requirements for this kind of analysis, software manufacturers are beginning to explore this niche.

There are various examples of programs created within the last few years specifically targeting social network analysis (SNA).²² Simulation designers have addressed the need to plug in rule sets derived from conceptual modeling. This can be accomplished by translating conceptual-derived data into computational algorithms and programmable agents in a synthetic environment, so the conceptual model (and its social fabric information) is embedded in the procedures.²³ Although this capability is assumed by JFCOM in doctrinal ONA publications, the technology is not yet there. Owen Cate, the Assistant Director of Security Studies Program at MIT, lauds the continuing research into SNA advances, but notes:

I think it's one of these cases when all the methodology, all the fancy software and all the other stuff -- if it's garbage in, it's going to be garbage out, so the question boils down to how much do we know about these groups...[i]f we don't know much about these groups, then I don't think these models will have much utility.²⁴

While Cate's statement can be viewed as outwardly negative, his point does support the need for integrated conceptual, humanistic, and cultural knowledge applied within any SNA simulation tool.

The "ONA brochure" glosses over current limitations and imparts an almost infallible capability: "...[ONA provides] pertinent expertise and information for *holistic analysis* [emphasis mine] of adversaries and the potential effects operations might have on them."²⁵

The issue remains that "current technologies cannot account for behavior related to the social or political context."²⁶ This shortfall was noted by the Information Operations personnel engaged in the Millennium Challenge 2002 (MC02) exercise: "Inadequate resources existed for producing...integration of cultural intelligence, psychological operations, public affairs, and civil affairs" into simulation models.²⁷

Future simulation and modeling systems must pull in these disparate variables. Dr. Kathleen Carley of Carnegie Mellon University, a leading researcher for next-generation SNA systems, is also concerned:

At the theoretical level, little is known about individual differences in balancing social, political, and group level concerns and goals. At the empirical level, the validity, collection, and bias issues...are distinct and little is known about how to calibrate data across levels.²⁸

The assumption that current off-the-shelf nodal analysis tools can provide "complete, accurate data" is precarious.²⁹ Missing and erroneous information must be scrutinized. ONA doctrine lacks discussion on any process for vetting such information, nor any Quality Assurance measures. Understanding the limitations of data input must be addressed to shape the boundaries of resultant computations.

Understanding Data: Quality, Quantity, and Value

One should never use elaborate scientific guidelines

as if they were a kind of truth machine.”³⁰

--- Carl von Clausewitz

In any computational model, validity of information must be calculated or weighed. Analysts must identify the data as “valid for whom?”³¹ This is especially true in calculating metrics of success. ONA doctrine expresses the measurement of interagency and COE entities “working better together” as such a validation metric.³² Some may argue the amount of data provided for SoSA or level of outside organization participation is relevant. In reality, quality assurance of information analyzed and prepared for dissemination should be a significant level of effort within ONA.

This is a difficult process for SNA. Traditional analytic tools are “data greedy”: Very detailed information is required to establish nodal understanding and rudimentary relationships.³³ When one contemplates shifting analysis from static to dynamic networks (such as terrorist organizations or economic agents), data requirements become even more demanding and the focus of the ONA organization could slide precariously to quantity of input in order to “keep up” with the changes. ONA analysts must resist the desire to create the largest string of data, but instead focus on data selection. “[An] effect of pushing intelligence down the road of science is the tendency to view quantifiable capabilities as more accurate and also more important than qualitative intentions.”³⁴

SoSA modeling of PMESII systems becomes fixated on generating rapid calculations and compiling the requisite amount of data.³⁵ As SoSA is about crafting intelligence and not simply generating information, the pitfalls of observing an adversary through a faulty

spyglass remain.³⁶ What you interpret may be, in fact, exactly what your opposite number wants you to perceive. “In the case of intelligence analysis, deception is the rule...the validity of the data is always in doubt.”³⁷

An example is provided by the Joint Forces Intelligence Command (JFIC). One goal of JFIC is to reduce the amount of time exhausted on collecting and processing information in order to focus weight of effort upon analysis. Their metric is speed of information input:

“For a system-of-system analysis, Experimentation Directorate personnel [at JFCOM] said it would take six man-years to conduct the nodal analysis for a specific country. We took a tool and did the same search that identified all the nodes in 20 hours. That was just the beginning of the research, but there are tools out there to get through all of the front end of the data.”³⁸

This example does present an excellent ability to rapidly focus on the “exploitation” phase of the Process, Exploitation, and Dissemination (PED) intelligence cycle. Analysts are allowed more time to review the simulation output; however, the mantra of “trust, but verify” cannot be dismissed. If analysis does not begin until the initial simulation runs are complete, how much error (or deception) have you already absorbed?

Some may argue the concept of reducing all adversary mechanisms to a network model is the most effective procedure to create rapid, computational products through SNA modeling. Cognitive, conceptual analysis takes time and narrative research does not translate into quick action. In a crisis situation, a purely qualitative approach would be detrimental. However, boiling all of an adversary’s relationships or organizations down to a network “cookie cutter” may not be beneficial and can be a square-peg-in-round-hole situation.

While systems of interest may be presented as networks,

Many (particularly economic, social and political systems) may also be usefully represented other ways, for example as hierarchies/organizations, small group decision-making bodies, individuals engaged in bargaining...collective action...[and all] subject to social and cognitive biases.³⁹

DARPA, in its design work for the Integrated Battle Command system, is similarly concerned that “conventional models may not be relevant” for all adversary dynamics.⁴⁰ Black markets within an economy, illegal imports and exports, social demographics, physical and political structural changes can all affect our ability to determine cause.⁴¹ This discussion is particularly relevant when a JTF is involved in Security and Stability Operations (SASO) or Flexible Deterrent Operations. During these conditions, *influence* and not destruction is the prime directive. In these situations, a network model would need to weigh values based on social and conceptual information.

This is a challenge, as cultural factor weights are normally very difficult to ascertain and apply some level of subjectivity.⁴² Priorities within the relationship are assigned based on observed or assessed organizational decision points.⁴³ Because ONA drives a network-mapping focus, some may argue that SoSA is to simply “connect the dots [and] isolate the key actors who are often defined in terms of their ‘centrality’ to the network.”⁴⁴ The weakness is nodal analysis cannot be taken strictly at face value. “[R]emoval of the most central node might leave a network less vulnerable than removal of an emergent leader,” when applying against an organization, such as a terrorist group.⁴⁵ Nodes and ties resulting from a simulation are influenced by the inherent biases obtained by a given sampling procedure.⁴⁶ The model (or the analyst) can over-or-under-sample certain types of relations, which in output will “strategically misreport” specific ties and links.⁴⁷

As ONA and SoSA capabilities mature, they must be linked to improved SNA model simulations that take into account the dynamic, cognitive data faced throughout the spectrum of military tasks, not just higher-level war-making. Models need to provide a “significant degree of irreducible uncertainty associated with the psychological, inter-personal, and

bureaucratic processes within future US adversaries....”⁴⁸ Today’s prism of globalization, failed states, and economic change all point to increased uncertainty. Therefore, not only must newer generation SNA simulation models factor these scenarios, but ONA analysts and intelligence professionals must also operate under a scalable threshold of uncertainty and gaps in order to continue production efforts and remain relevant to the warfighter.

Potential for Bias and Error

*The facts are mugged long before they reach decision-makers.*⁴⁹

--- Alexander Butterfield

One must be aware of the propensity for either deliberate or unknown subjectivity of information provided to SoSA analysts. The focus of a particular Subject Matter Expert (SME) involved could be compartmentalized vis-à-vis the broader perspective of a problem. Network dynamics under observation can be “based on the estimates of Subject Matter Experts using largely the *subjective* [emphasis original] high-level data often narrowed to a particular area of expertise.”⁵⁰ Subjectivity can increase through cultural lens discrepancies within our own (Blue) sphere. That cultural differences exist to a certain degree between military services within DoD is a given; however, the differences between governmental agencies are vast, and those outside of government are even further removed.

One agency’s view of mission, legal definitions, and constraints may all vary from that of the SJFHQ and other US Government (USG) organizations.⁵¹ A stark example of agency dichotomy is illustrated between the Department of Justice, Department of Homeland Security, and the State Department concerning a new fingerprint database. An argument between the agencies erupted over standardizing the number of fingers per hand required for the prints.⁵² Neither agency could agree on the number to be used. According to DOJ

Inspector General (IG) Glenn Fine: “Agency infighting...*undermined this effort* [emphasis original]. The agencies ‘have different sets of mission objectives, and each one has been a forceful advocate for its respective position.’”⁵³

This is especially true outside of the USG, where NGOs, academia, and think tanks are involved; the COE core for ONA input. “Each is not a totally disinterested party and so achieving balance” is required.⁵⁴ Political biases among academics may arise, as well as potential pandering to ensure DoD funding consideration. NGOs have their own personal histories and their “own ‘beef’ with working alongside the military.”⁵⁵ Desire for independence and non-alignment may prevent certain organizations from working with DoD altogether or cloud the information provided. Even within some operational missions, NGOs may limit or slant data to preserve their neutrality. Each agency or organization will have a specific “solution space” they can provide for analysis; whether that “space” is fully exhausted will affect the reliability of SoSA.⁵⁶

Value weight dissonance among different SMEs and COEs can cause problems and requires debate among the ONA analysts and the collaborative network group. Agency or COE contribution can affect subsequent course of action (COA) decisions by the Commander.⁵⁷ Models may be laden with information “intentionally misleading, inaccurate, out-of-date, and incomplete.”⁵⁸ Faulty assumptions will then become inherent and skew any displayed relationships among the proposed network and negatively affect results that will be used for decision-making. Information used for SNA modeling must be critically reviewed by ONA analysts. The goal should be to eschew the “quantity is quality” factor; the number of experts consulted does not a fool-proof simulation make.⁵⁹ Factor weights among the Interagency Community and COE participants may differ and can be very subjective. Bias

and analyst perceptions are factors that cannot be adjusted in any simulation modeling process. “You can’t just wish it away or algorithm it outta there.”⁶⁰

Social Network Analysis: Limitations and Development

*Models are to be used, not believed.*⁶¹

--- H. Theil

In order to conduct analysis to determine “what-if” scenarios, as per the charge for ONA, we must look to social and business decision aids as examples.⁶² System simulations have the ability to test various policies (actions and influences) to determine effects.⁶³ However, the analyst and the warfighter must always understand the simulation is nothing more than just a model. It is not ground truth. There are specific limitations, fully understood by programmers and researchers, but ignored or dismissed as assumptions in ONA doctrine.

Current systems in the field used by government primarily deal with traditional social systems comprised of small, bounded networks.⁶⁴ There are problems when one is tasked to run analysis upon covert networks (such as a terrorist organization) or other situations of significant missing information. The current SNA tools do not scale well in these cases, and grow exponentially flawed due to error with increased network size. There is no “graceful degradation” catch within the algorithms.⁶⁵ The missing data can be somewhat mitigated by increasing the amount of true knowledge used; however, that requires many specifics (back to the “data greedy” concept) and can be extremely difficult.⁶⁶ Discriminating data in order to tailor effects and results within an AOR-wide swath at the Regional Combatant Commander-level can be increasingly tricky.

Additionally, the current DIME construct within ONA does not effectively factor other sources of US national power that can affect the simulation model, such as SOF activities, intelligence collection, humanitarian assistance, and law enforcement.⁶⁷ When viewing through the lens of SASO in Iraq, where a total civil culture is in upheaval and organizations change routinely, simplified simulation runs are not effective.⁶⁸ The uniqueness of certain crises may be too far out of the normal “sim-box” for merely allowing the analytical tool to run calculations and offering these up as “the answers.” With many variable factors, one must be cautious in reliance upon the network as a capable template for analysis under every situation. Philip Cerny touches on this premise in his theory of a growing “neomedievalism” among societies:

As in the Middle Ages, occupational solidarity, economic class, religious or ethnic group, ideological preference, national or cosmopolitan values, loyalty to or identity with family, local area, region, etc., will no longer be so easily subsumed in *holistic images* [my emphasis] or collective identities...National identities are likely to become increasingly...divorced from real legitimacy, “system affect,” or even instrumental loyalty.⁶⁹

The ability to maintain accurate computations in light of ever greater qualitative change is the challenge for future SNA tools. Assumptions, inherent within current modeling tools, must be accepted as mere possibilities, not pure fact. Simulations “explore realms of the *possible* [my emphasis] rather than predicting the future of a specific event or action.”⁷⁰ Prediction is difficult and can be dangerous when presenting surmised resultant effects. SNA tools cannot tell us what Red *will* do, but they can tell us either his possible reactions or those effects negative for Blue. Any missing data or uncertainty will degrade the prediction as those “holes” are extrapolated throughout the model. This weakness in current modeling techniques is understood by programmers. As an after-action discussion following war-gaming with JFCOM, Dr. Jim Miller of the Center for Adaptive Strategies noted the

challenge for effects determination: “Any decision support system that is reliant on such predictions and assessments must cope with rampant uncertainty.”⁷¹

Tools are needed to conduct analysis of *why* and *how* algorithms compute what they do. Given the previous JFIC example of 20 man-hours of front-end nodal analysis crunching, a future model could not only conduct such a baseline effort, but also provide further analysis into locating higher (or lower) confidences, cueing further examination. Unfortunately, such tools are not yet fully operational. Work in this endeavor remains within “pretty new and untested ground.”⁷² Although Joint and Fleet advocates for ONA and SNA modeling desire a snapshot of current controlled laboratory systems turned into a tool for use *now*, science cannot yet support this level of capability.⁷³

Therefore, analysts must be aware of the dynamics in the product ultimately packaged for the decision-maker.⁷⁴ Analysts and planners must not only be conscious of simulation and data limitations, but also cognizant of the level of error or model adaptability permitted. Because ONA cannot only be focused on baseline, long-term data analysis, the construct applied must be scalable to support the commander’s timeline for decision. An example of such a scope is what the author has termed the “Butterfield Scale,” based on prior study of analysis and judgment indicators by Alexander Butterfield.⁷⁵

<u>SITUATION</u>	<u>TOLERANCE</u>	<u>EXAMPLE</u>
Peacetime	Low tolerance for error Low rate of change	ONA baseline efforts
Tensions	Medium tolerance for error Medium rate of change	Crisis build-up
Wartime	Friction accepted Metric is speed of assessments	OIF Phase III

Understanding the cognitive aspect of the simulation model input will improve the capability to discern potential “fault lines” within the results, to a degree. As the intensity of action increases, simultaneously with the desire for rapid assessments, scalability must come into play and some fidelity tossed over the side.

The “Butterfield Scale” allows ONA and its requisite tools to remain relevant from major combat to SASO. To make the process relevant, ONA personnel must provide “truth in lending” to the operators and the commander. Promising peacetime levels of granularity and prediction when speed of dissemination is paramount will place the analyst in a situation of writing checks he cannot cash. Many PMESII effects require a significant amount of time to materialize and various levels of ISR support are necessary to coordinate the sensing of those effects.⁷⁶ Along the scale, one must determine to stick with a proposed model and press ahead toward production. Once that decision has been made, the analyst is obligated to inform the planners and decision-makers of the confidence levels for the analysis in a final segment of ONA.

The Requirement for Critical Debate

*This type of knowledge cannot be forcibly produced by an apparatus of scientific formulas and mechanics; it can only be gained through a talent for judgment, and by the application of accurate judgment to the observation of man and matter.*⁷⁷

--- Carl von Clausewitz

In review of business management approaches to decision-support systems, a clear premise is founded in the fact that “what-if” gaming cannot replace leadership debate over courses of action or intentions.⁷⁸ While “[m]odels help the decision makers...understand the key mechanisms of an existing process” by revealing a specific interpretation of relations, the

presentation to decision-makers must encourage debate rather than provide a specific definitive answer.⁷⁹ ONA doctrine does call for a review of effects and actions for each specific DIME source of national power; however, self-analysis is limited to individual teams focusing only on their particular DIME slice of the overall problem.⁸⁰ There is no process to “bring it all home” through an overall analysis to compare and contrast causal results among the DIME elements against each other. This is important to enhance not only any critical analysis of Blue actions, but also to provide various possibilities to the commander on Red intentions and response. An example of the potential for differing views of Blue or Red actions lies in a wargame sponsored by JFCOM in 2002. Two different Red teams devised two totally separate COAs and decision-processes resulting from the Blue team’s actions. After review by CIA and DIA representatives present, both Red COAs were deemed credible.⁸¹ Scenarios such as this make a statement for ONA teams to conduct multiple reviews of action proposals. Further, it highlights the need for critical debate among not only ONA and EBO planners, but the commander himself, in order to review his concerns over various possibilities.

Analytical output of ONA and EBO cannot be presented in a linear fashion. Products created cannot be placed before the commander to state “ONA says X will result in Y.” John Shanahan presents the concept of “green, yellow, and red indicators” for prediction confidence.⁸² This compliments the “Butterfield Scale,” where analysts set boundaries for information fidelity based on operational necessity. Offering a range of possible effects or possible influence actions along with confidence values allows critical debate, not just a laundry list of model outputs. To simply proffer a set menu would be akin to the “worst of Vietnam-era ‘systems analysis.’”⁸³

Because predictive analysis can be very problematic, if not outright misleading, one must encourage debate among planners and leadership to identify acceptable metrics for decision, whether military, social, or politically motivated. The emphasis must be exercising judgment at the analyst, planner, and leadership levels. “Most important decisions inherent in assessment, planning, and operations are based on judgment – which is informed not only by information, but also by discussion, debate, and past experience.”⁸⁴ Debate in ONA literature is limited to EBO planners and ONA analysts. There must a broader approach involving command leadership. That is not to say ONA results must be handled in an Industrial Age mentality. The SNA tools and computational systems available now and in development can be significant factors in an intensive, critical analysis of EBO options. The need for scalable analysis demands this capability. The commander directing teams to argue with the computer, based on their individual approaches, to discern various effects and options for action is an example of such debate.⁸⁵ This allows both the commander and the analyst/planners to be involved in the process, not simply forcing the commander into a “take-it-or-leave-it” situation.

Conclusion and Recommendations

When I have a particular case in hand, I...love to dig up the question by the roots

*and hold it up and dry it before the fires of the mind.*⁸⁶

--- Abraham Lincoln

Improving ONA requires the comprehension of shortfalls existent within our own assessments and predictions. Bias, error, and subjectivity will always remain; therefore, future work in ONA is needed to readily understand thresholds of these limitations, provide degrees of confidence, and openly engage in critical debate over resultant decisions. Social

network analysis tools used in SoSA cannot be honestly sold as the sole determinant for success. Ideas, systems, and metrics are moving in the right direction, but gaps remain.⁸⁷

ONA theory must turn away from the “magic bullet syndrome” and instead focus on limiting and understanding uncertainty. While analysts cannot fully eliminate preconceptions and error, they can leverage effort to tamp it down.⁸⁸ One must select the models that best fit and ignite the white heat of analysis.

JFCOM must engage the COE for SNA research in concert with DoD and the Intelligence Community to develop more adaptable capabilities. In tandem with grappling the mechanical, ONA teams must exercise control over the procedural; viewing not as a catch-all menu, but rather a beginning for further debate. We do not yet have reliable “devil’s advocate” analytical systems, and work is needed to improve SNA analytical tools for military decision-making and planning.⁸⁹ A realistic ONA process, subsequent to a baseline of critical self-analysis and validity knowledge, must be the goal for future research at JFCOM and within the developing SJFHQs.

NOTES

¹ Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret, indexed ed. (Princeton: Princeton University Press, 1984), 117.

² Rob Johnston, "Developing a Taxonomy of Intelligence Analysis Variables," *CIA Studies in Intelligence* 47, no. 3 (2003), available from <http://www.cia.gov/csi/studies/vol47no3/article05.html>; Internet, p. 3, quoting Ephraim Kam, *Surprise Attack: The Victim's Perspective* (Cambridge, MA: Harvard University Press, 1988), 120.

³ Robert D. Deutsch, "Probing Images of Politicians and International Affairs: Creating Pictures and Stories of the Mind," *Indoctrinability, Ideology, and Warfare: Evolutionary Perspectives*, ed. Irenaus Eibl-Eibesfeldt and Frank K. Salter (New York: Berghahn Books, 1998), 303.

⁴ Alexander Butterfield, "The Accuracy of Intelligence Assessment: Bias, Perception, and Judgment in Analysis and Decision" (Advanced Research Project student paper, United States Naval War College, Newport, RI: 1993), 16.

⁵ President Dwight Eisenhower, quoted in William B. Pickett, *George F. Kennan and the Origins of Eisenhower's New Look: An Oral History of Project Solarium*, Princeton Institute for International and Regional Studies, monograph series, no. 1 (2004): 11.

⁶ Joint Chiefs of Staff, *Doctrinal Implications of Operational Net Assessment (ONA)*, Joint Warfighting Center Doctrine Pamphlet 4 (Washington, DC: 24 February 2004), 1.

⁷ Johnston, "Developing a Taxonomy of Intelligence Analysis Variables," 3.

⁸ Joint Chiefs of Staff, *Doctrinal Implications of Operational Net Assessment (ONA)*, 5.

⁹ Ibid.

¹⁰ Joint Chiefs of Staff, *Standard Operating Procedure & Tactics, Techniques and Procedures for the Standing Joint Force Headquarters (Core Element)*, draft version (Washington, DC: 14 July 2004), 2-8.

¹¹ Johnston, "Developing a Taxonomy of Intelligence Analysis Variables," 3.

¹² Joint Chiefs of Staff, *Draft Standard Operating Procedure for the Standing Joint Force Headquarters*, 2-5.

¹³ Ibid.

¹⁴ Johnston, "Developing a Taxonomy of Intelligence Analysis Variables," p. 2, quoting Charles Allen, Associate Director of Central Intelligence for Collection, at a public seminar on intelligence at Harvard University, Spring 2000. Available from <http://pirp.harvard.edu/pdf-blurb.asp?id=518>; Internet.

¹⁵ Douglas K. Zimmerman, "Understanding the Standing Joint Force Headquarters," *Military Review* (July-August 2004), 31.

¹⁶ Rebecca Goolsby, "Developing Social Science Based Applications for the Navy: Lessons from ONR" (PowerPoint briefing presented to the Navy Enterprise Conference, 05 August 2004), available from http://www.onr.navy.mil/about/conferences/rd_partner/docs/misc/aug5/02goolsby.pdf; Internet, slide 4.

¹⁷ Ibid., slide 6.

¹⁸ Kathleen M. Carley, “Estimating Vulnerabilities in Large Covert Networks” (paper presented as part of the Dynamic Networks project supported by the Office of Naval Research, 2004), available from <http://experiments.tepper.cmu.edu/speakers/Carley1.pdf>; Internet, pp. 2-3.

¹⁹ Johnston, “Developing a Taxonomy of Intelligence Analysis Variables,” p. 3, quoting J.R. Thompson, R. Hopf-Weichel, and R. Geiselman, *The Cognitive Bases of Intelligence Analysis* (Alexandria, VA: Army Research Institute, Research Report 1362, 1984), AD-A146, 132, 7.

²⁰ Ben Connable, “Cultural Intelligence in Iraq: Lessons Learned” (PowerPoint briefing from Headquarters Marine Corps Intelligence Department, Washington, DC: 2004), slide 6.

²¹ Department of the Army, “Stability Operations Joint Operating Concept (SO JOC),” *Army Transformation Roadmap 2003*, (Washington, DC: 2003), 4-4.

²² “Computer Programs for Social Network Analysis,” available from www.insna.org/INSNA/soft_inf.html; Internet; 03 November 2004. These include Apache Agora (for visual representation), daVinci (which draws ordered relations for users), the Ecosystem Network Analysis (providing “quantitative methods that systematically teases most pertinent information from the full, complicated network”), KeyPlayer (nodal removal analysis), and MetaSight (a SNA toolset that derives relationships via e-mail traffic).

²³ Rebecca Goolsby, <GoolsbR@ONR.NAVY.MIL>, “Further Research Information,” [E-mail correspondence with the author michael.hannan@nwc.navy.mil], 31 January 2005.

²⁴ Karen Roebuck, “CMU Project Targets Terrorism,” *Pittsburgh Tribune Review*, 19 June 2004; available from http://www.pittsburghlive.com/x/search/s_199550.html; Internet, p. 1.

²⁵ Zimmerman, “Understanding the Standing Joint Force Headquarters,” 30.

²⁶ Carley, “Estimating Vulnerabilities in Large Covert Networks,” 15.

²⁷ Mark W. Maiers and Timothy L. Rahn, “Information Operations and Millennium Challenge,” *Joint Forces Quarterly*, no. 35 (2004): 84.

²⁸ Carley, “Estimating Vulnerabilities in Large Covert Networks,” 15.

²⁹ Goolsby, “Developing Social Science Based Applications for the Navy,” slides 9-10.

³⁰ Clausewitz, *On War*, 168.

³¹ L. R. Gay, *Educational Research: Competencies for Analysis and Application*, 5th ed. (Saddle River, NJ: Prentice-Hall, 1996), 139.

³² Joint Forces Command, “Interagency Working Group E-Newsletter,” Electronic document, September 2004; available from <http://www.ndu.edu/ITEA/storage/558/September%2004%20Newsletter.pdf>; Internet, p. 5.

³³ Ronald Breiger, Kathleen Carley, and Philippa Pattison, ed., *Dynamic Social Network Modeling and Analysis: Workshop Summary and Papers* (Washington, DC: National Academies Press, 2003), 4.

³⁴ Butterfield, “The Accuracy of Intelligence Assessment,” 20.

³⁵ Defense Advanced Research Projects Agency, “Integrated Battle Command”; available from <http://www.darpa.mil/ato/solicit/IBC/faq.htm>; Internet; accessed 22 January 2005.

³⁶ The author has concern for the creeping proliferation of the misnomer “information” for what is in reality, “intelligence.” As an example, ONA doctrine has created the “Information Superiority” Directorate within the SJFHQ which contains ONA and SoSA. See Steven E. Maffeo’s *Most Secret and Confidential: Intelligence in the Age of Nelson* (London: Chatham Publishing, 2000), pp. xix-xx for a good primer on the differences in terminology. In the author’s opinion, no matter how much one “moves the deck chairs,” what is referred to today as “information” or “knowledge” is, in fact, intelligence.

³⁷ Johnston, “Developing a Taxonomy of Intelligence Analysis Variables,” 2.

³⁸ Maryann Lawlor, “Transformation Turns Intelligence Around,” *Signal* 58, no. 9 (May 2004): 20-22; quoting CAPT William Reiske, USN, Commanding Officer of the Joint Forces Intelligence Command.

³⁹ Jim Miller, “Operational Net Assessment: What Are the Real Challenges?” *Defense Adaptive Red Team Working Paper 03-1* (Arlington, VA: Hicks and Associates, Inc., 2003), 1.

⁴⁰ Defense Advanced Research Projects Agency, “Integrated Battle Command.”

⁴¹ Ibid.

⁴² Barry Render and Ralph M. Stair, Jr., *Quantitative Analysis for Management*, 6th ed. (Saddle River, NJ: Prentice-Hall, 1997), 562.

⁴³ Ibid.

⁴⁴ Carley, “Estimating Vulnerabilities in Large Covert Networks,” 2.

⁴⁵ Breiger, Carley, and Pattison, *Dynamic Social Network Modeling and Analysis*, 7.

⁴⁶ Ibid., 13.

⁴⁷ Ibid.

⁴⁸ Miller, “Operational Net Assessment,” 9.

⁴⁹ Butterfield, “The Accuracy of Intelligence Assessment,” 17.

⁵⁰ Carley, “Estimating Vulnerabilities in Large Covert Networks,” 7.

⁵¹ Rebecca Goolsby, <GoolsbR@ONR.NAVY.MIL>, “Research Request,” [E-mail correspondence with the author michael.hannan@nwc.navy.mil], 29 December 2004.

⁵² Tom Regan, “Fingerprint database still a problem,” *Christian Science Monitor*, 30 December 2004; available from <http://www.csmonitor.com/2004/1230/dailyUpdate.html>; Internet.

⁵³ Ibid., quoting DOJ Inspector General Glenn Fine.

⁵⁴ Goolsby, e-mail correspondence, 29 December 2004.

⁵⁵ Ibid.

- ⁵⁶ Goolsby, e-mail correspondence, 31 January 2005.
- ⁵⁷ Miller, "Operational Net Assessment," 8.
- ⁵⁸ Ibid.
- ⁵⁹ Carley, "Estimating Vulnerabilities in Large Covert Networks," 3.
- ⁶⁰ Goolsby, e-mail correspondence, 31 January 2005.
- ⁶¹ Henri Theil, *Principles of Econometrics* (New York: Wiley, 1971).
- ⁶² Render and Stair, Jr., *Quantitative Analysis for Management*, 714.
- ⁶³ Ibid.
- ⁶⁴ Carley, "Estimating Vulnerabilities in Large Covert Networks," 6.
- ⁶⁵ Ibid.
- ⁶⁶ Goolsby, e-mail correspondence, 31 January 2005.
- ⁶⁷ Miller, "Operational Net Assessment," 7.
- ⁶⁸ Connable, "Cultural Intelligence in Iraq," slide 10.
- ⁶⁹ Philip G. Cerny, "Terrorism and the New Security Dilemma," *Naval War College Review* 58, no. 1 (Winter 2005): 26-27.
- ⁷⁰ Breiger, Carley, and Pattison, *Dynamic Social Network Modeling and Analysis*, 8.
- ⁷¹ Miller, "Operational Net Assessment," 7.
- ⁷² Goolsby, e-mail correspondence, 31 January 2005.
- ⁷³ Ibid.
- ⁷⁴ Rebecca Goolsby, "Combating Terrorist Networks" (PowerPoint briefing, June 2003); available from http://www.dodccrp.org/events/2003/8th_ICCRTS/Pres/track_5/1_1430goolsby.pdf; Internet, slide 31.
- ⁷⁵ Butterfield, "The Accuracy of Intelligence Assessment," 71-75.
- ⁷⁶ Defense Advanced Research Projects Agency, "Integrated Battle Command."
- ⁷⁷ Clausewitz, *On War*, 146.
- ⁷⁸ Render and Stair, Jr., *Quantitative Analysis for Management*, 13.
- ⁷⁹ Andreas Tolk, "Beyond Technical Interoperability: Introducing a Reference Model for Measures of Merit for Coalition Interoperability" (paper presented to the 8th International Command and Control Research and Technology Symposium, National Defense University, Washington, DC, 2003); available from <http://www.odu.edu/engr/vmasc/publications/tolk-betechint.pdf>; Internet, p. 8.

⁸⁰ Joint Chiefs of Staff, Draft *Standard Operating Procedure for the Standing Joint Force Headquarters*, B-22.

⁸¹ Miller, “Operational Net Assessment,” 9.

⁸² John Shanahan, “Shock-Based Operations: New Wine in an Old Jar” (student paper, National War College, 2001); available from <http://research.airuniv.edu/papers/ay2001/sister/shanahan.pdf>; Internet, p. 17.

⁸³ Ibid.

⁸⁴ Miller, “Operational Net Assessment,” 10.

⁸⁵ Goolsby, e-mail correspondence, 31 January 2005.

⁸⁶ Abraham Lincoln, quoted in Gene Griessman, *The Words Lincoln Lived By* (New York: Fireside, 1997), 99.

⁸⁷ Breiger, Carley, and Pattison, *Dynamic Social Network Modeling and Analysis*, 14.

⁸⁸ Butterfield, “The Accuracy of Intelligence Assessment,” 66.

⁸⁹ Goolsby, e-mail correspondence, 31 January 2005.

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